

New LN₂ Heat Exchanger for HEUB Helium Refrigerator

2/11/04 K. C.

- Work Scope and Progress
- Heat Exchanger
- Acknowledgement
- Photos on Installation & Removal of HX

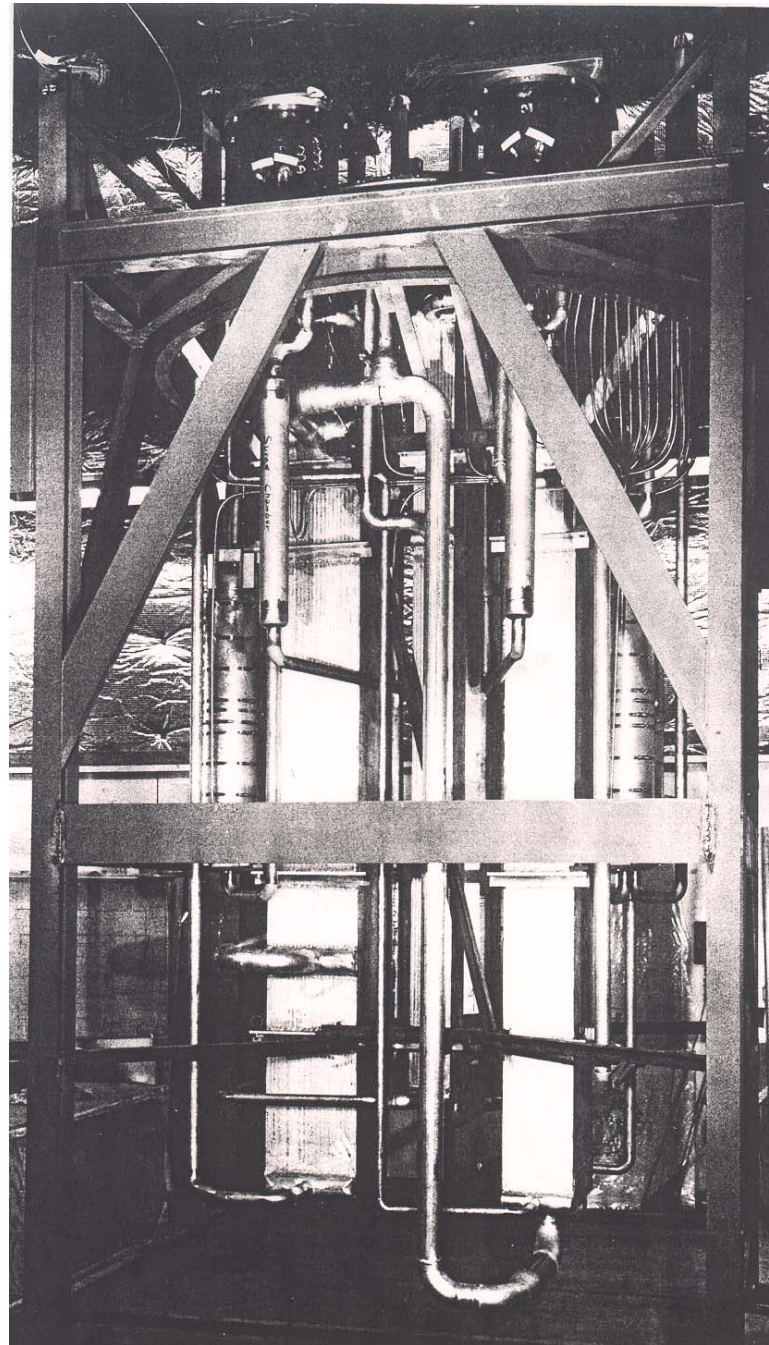
Work Scope and Progress

- 11/8/03 Found a large leak from H.P. to nitrogen side
When helium is 235 psia, the leak is
~ 150 SCFH_{air} using Dwyer flowmeter.
This leak appears to be the major source of
helium loss in the cryogenic system in B902.
- 11/10/03 Contact heat exchanger vendor – Chart Ind.
- 11/14/03 BNL decide to purchase a new HX
- 11/20/03 Chart Ind. received P.O.
- 11/25/03 Revise leak check specification to 10^{-7} st. cc/s
- 12/8/03 HX construction completed
- 12/17/03 HX arrived BNL

Progress of Installation

- 12/18/03 During construction of heat exchanger, HEUB was used to cool D1L101. Test complete on 12/18, warm up HEUB
- 12/22/03 Open cold box and start preparation
- 1/4/04 work
- 1/5 – Remove old HX and install new HX
1/23/04 Installation process is given in photos in the end
- 1/26 – Verify leak on old HX
1/30/04 Leak check new installation
- 2/5/04 Start HEUB, the LN2 HX works properly
Liquefaction rate is ~ 45 gal/hr (instead of 60 gal/hr) due to refrigerator contamination
NOT related to the installation

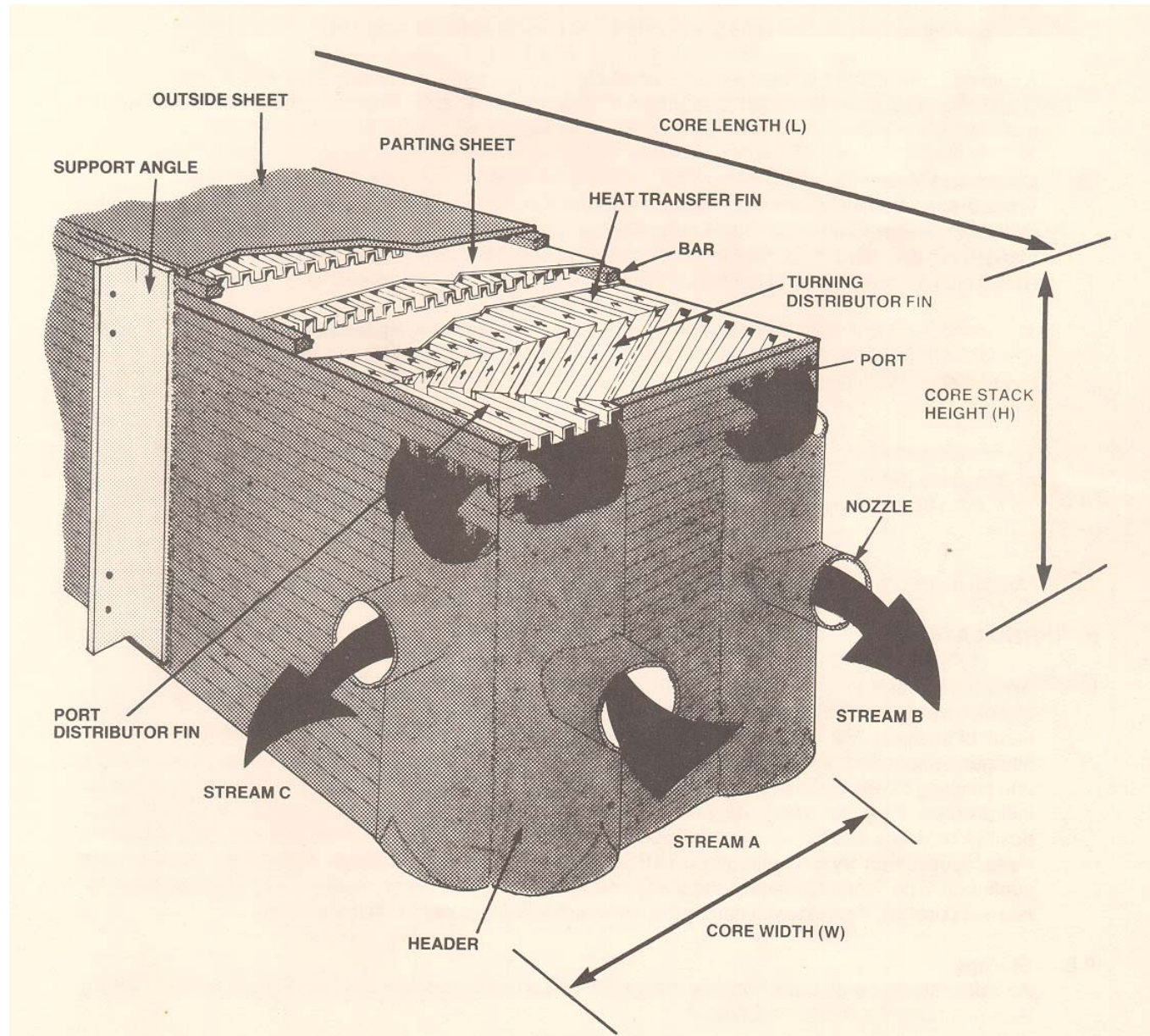
Front view of HEUB
cold box, LN₂ HX is
on the exchanger on
the right



LN₂ Heat Exchanger and Leakages

- HX has three streams: H.P, L.P. and LN₂
- H.P. helium is cooled by L.P. helium and liquid nitrogen in counter flow configuration.
- Leakages of helium occur from H.P. to L.P. stream and to nitrogen stream.
- The leakage from H.P. to L.P. is later found about twice that from H.P. to nitrogen stream.
- Leakage from H.P. to L.P. causes inefficiency to the cryogenic system.
- Leakage from H.P. to nitrogen causes **loss of helium gas**, system contamination and operating efficiency.

Basic Components of a Brazed Aluminum HX (Cutaway)

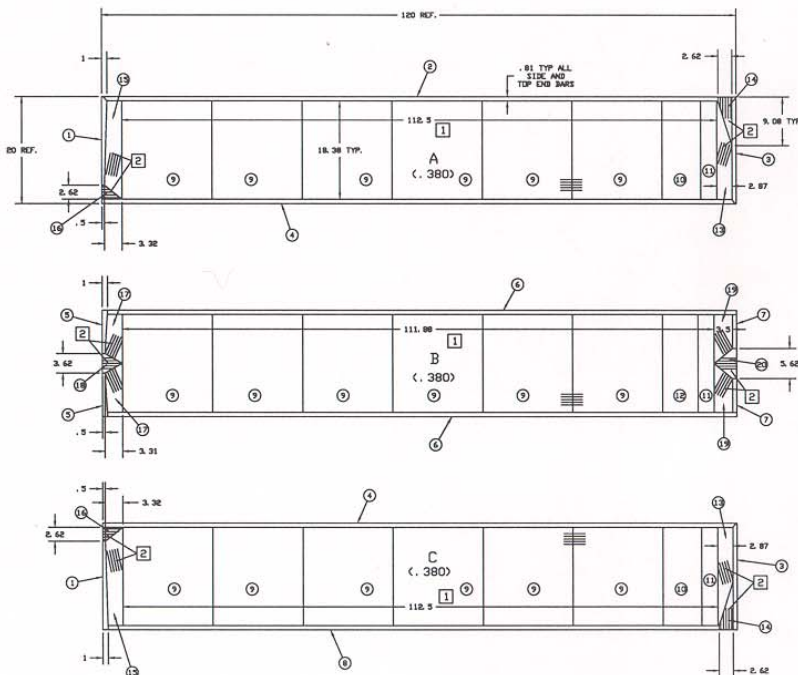


New LN₂ HX - Drawing 2

1	TYPE: 1/8 SERR MATL: .010 THK	FPI: 18.0 DIE: CT-7162
2	TYPE: PLAIN MATL: .016 THK	FPI: 8.0 DIE: CT-7221

PARTING SHEETS ARE .039 THK. (#020)
OUTSIDE SHEETS ARE .250 THK.
STACKED HEIGHT = 11.37
BRAZED HEIGHT = 11.26
CORE BLOCK WEIGHT = 1000 LBS.

OPERATIONAL
TOP END

[illegible]

STACKING
ARRANGEMENT

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Acknowledgments

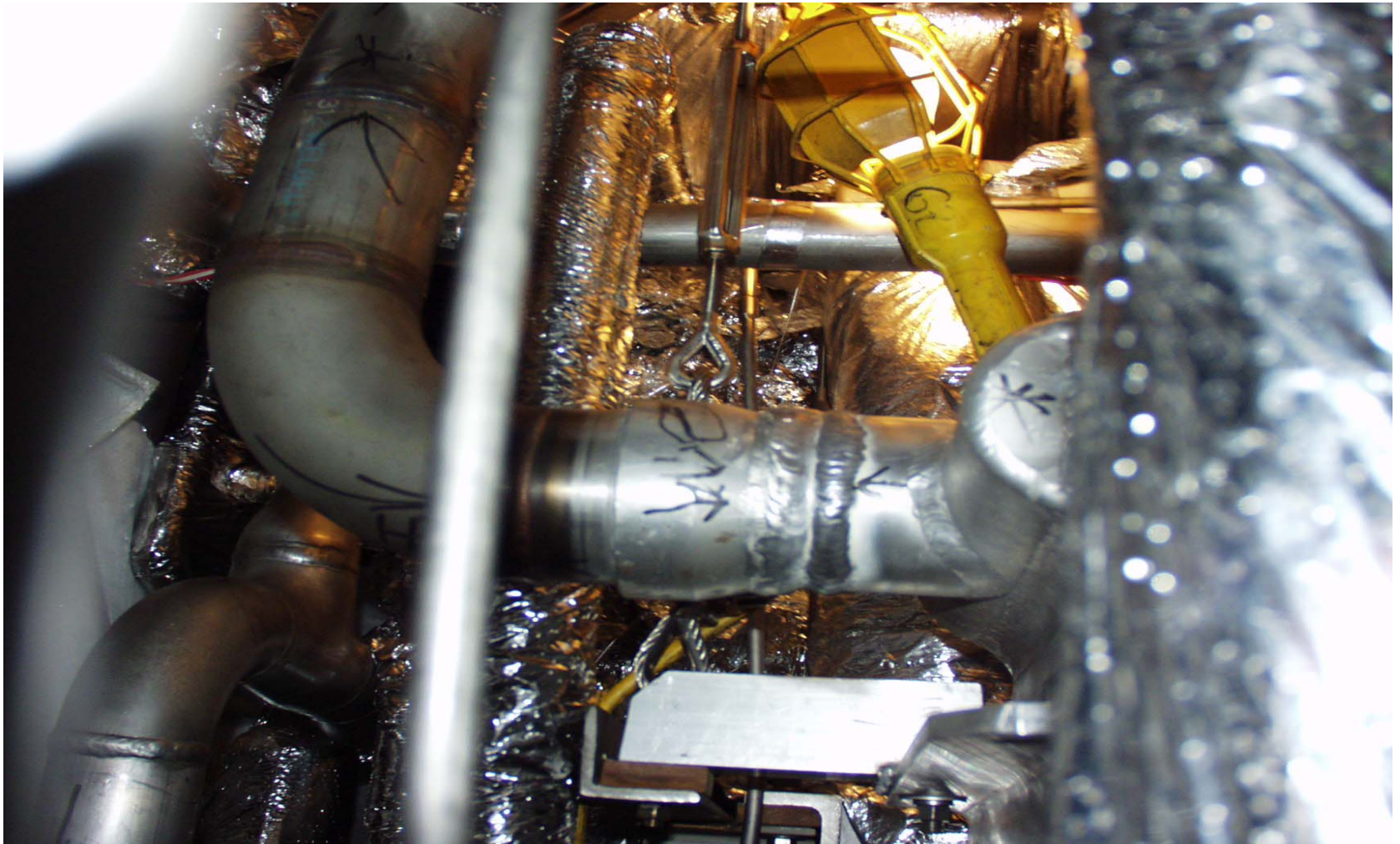
- Thanks to W. McKeon and G. Herbst for finding the leak
- The installation planning and work are carried out mainly by R. Picinich, W. McKeon and G. Herbst
- Contribution from BNL rigging crew under J. O'Malley is highly appreciated
- We also want to thank W. Ducoing for performing the welding in very tight space, F. Teich for leak check, J. Durnan for safety implementation, and numerous other personnel for various supports.

Photos on HEUB E-1 LN2 Heat Exchanger Removal And Replacement

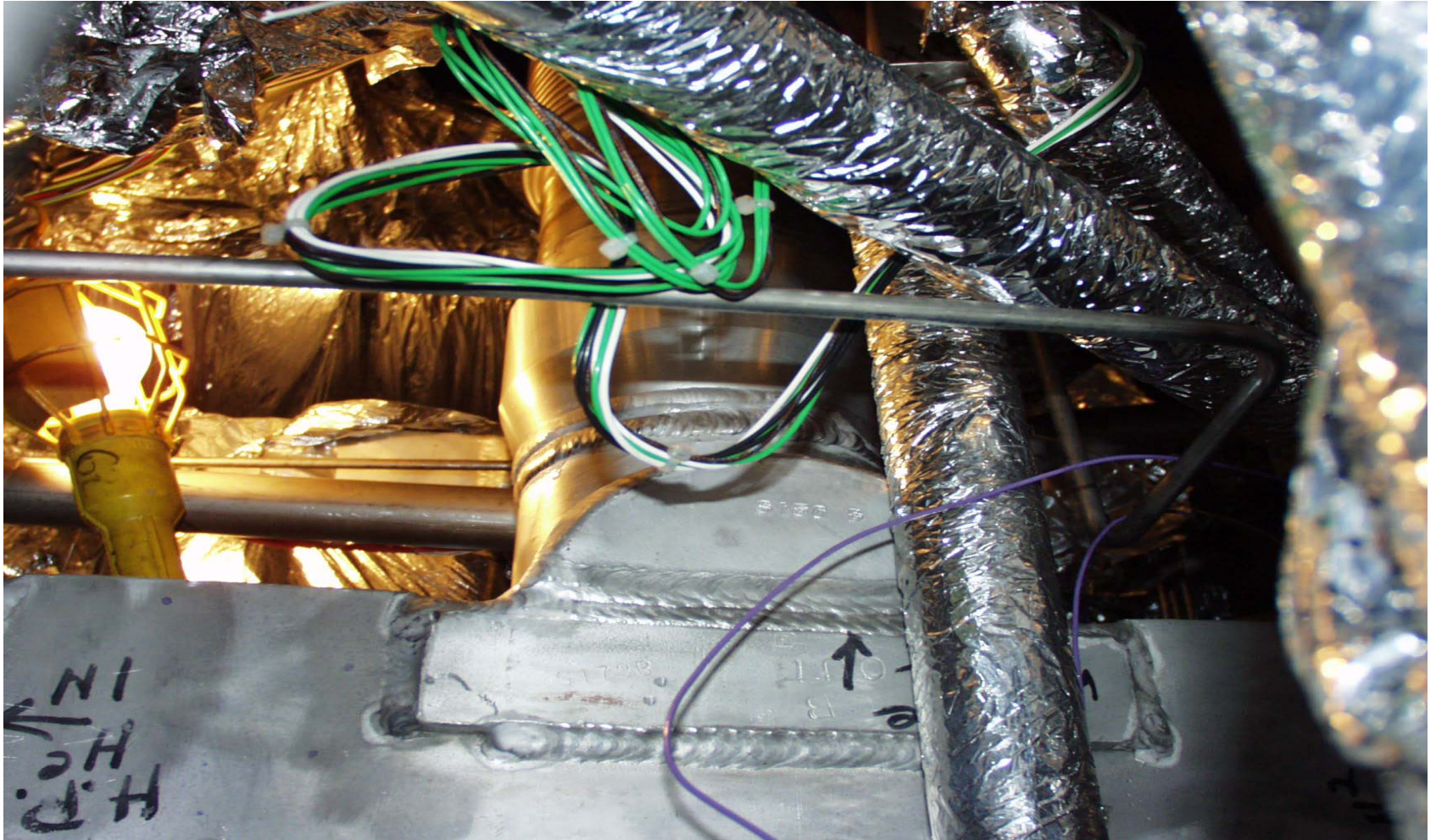
R. Picinich, Jan. '04

- A) Heat exchanger in place.
- B) Heat exchanger rigging.
- C) Heat exchanger removal.
- D) Pipe preparation.
- E) New heat exchanger installed.

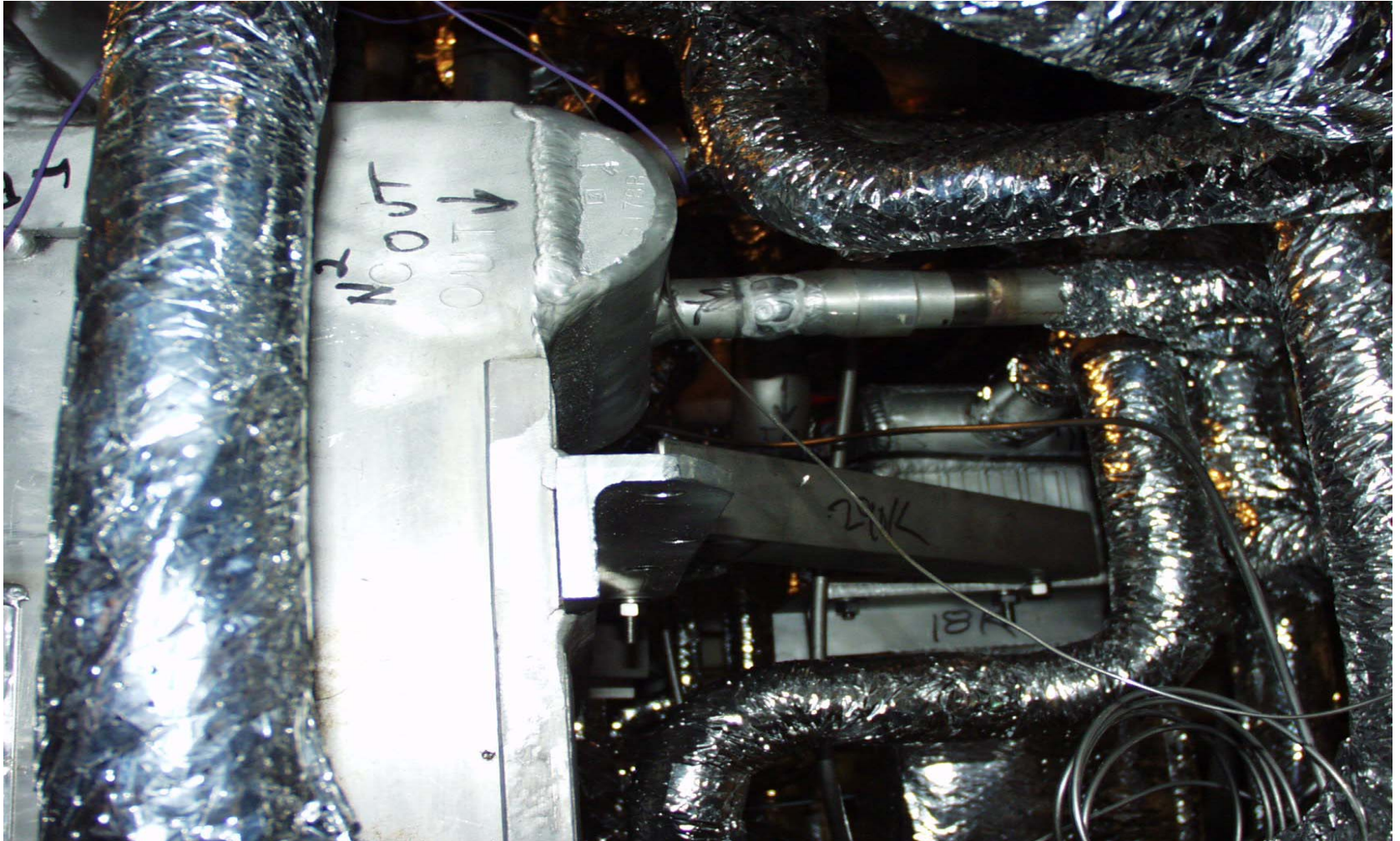
A.1) Heat exchanger high pressure inlet.



A.2) Heat exchanger low pressure outlet.



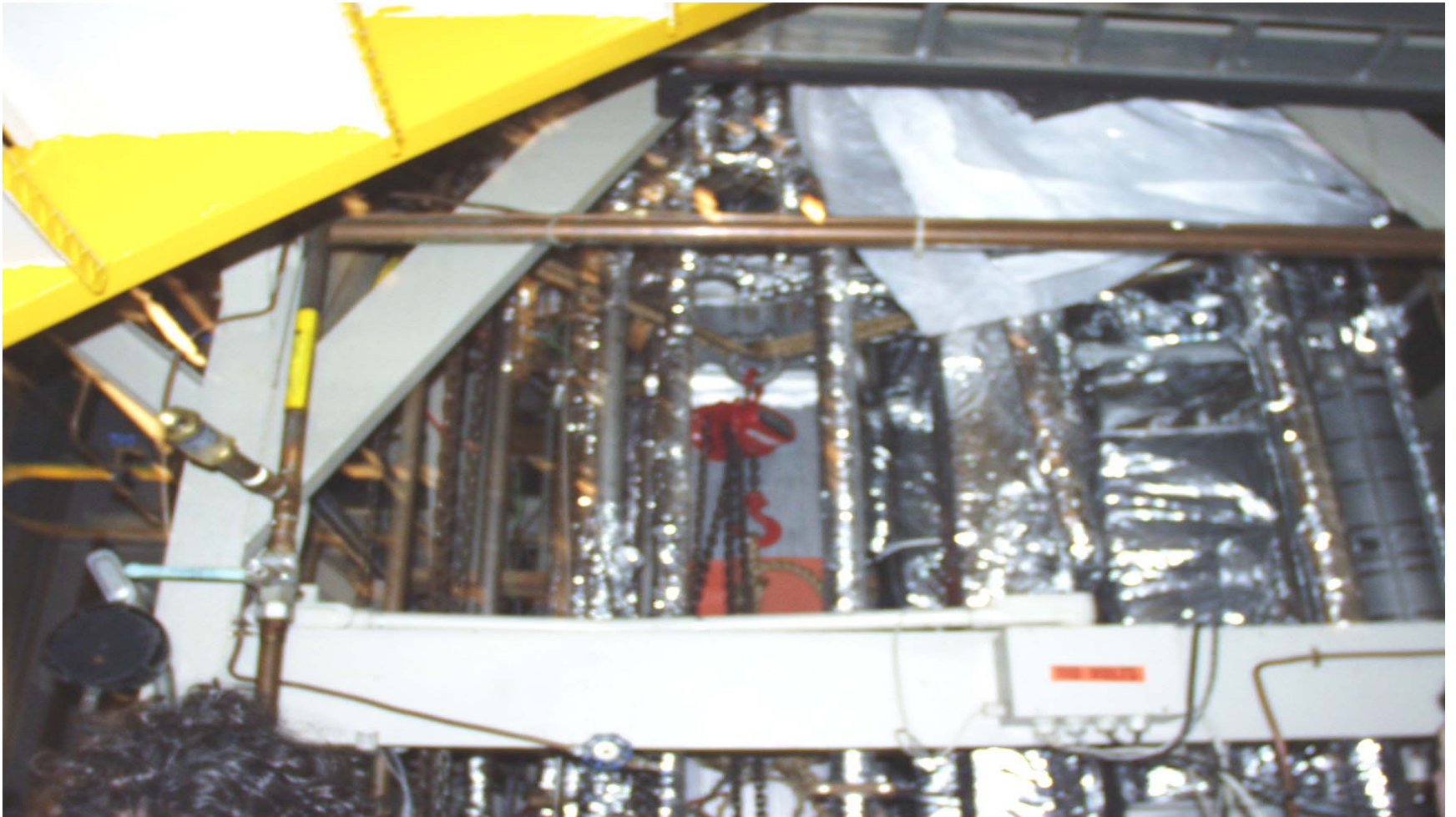
A.3) Heat exchanger LN2 outlet.



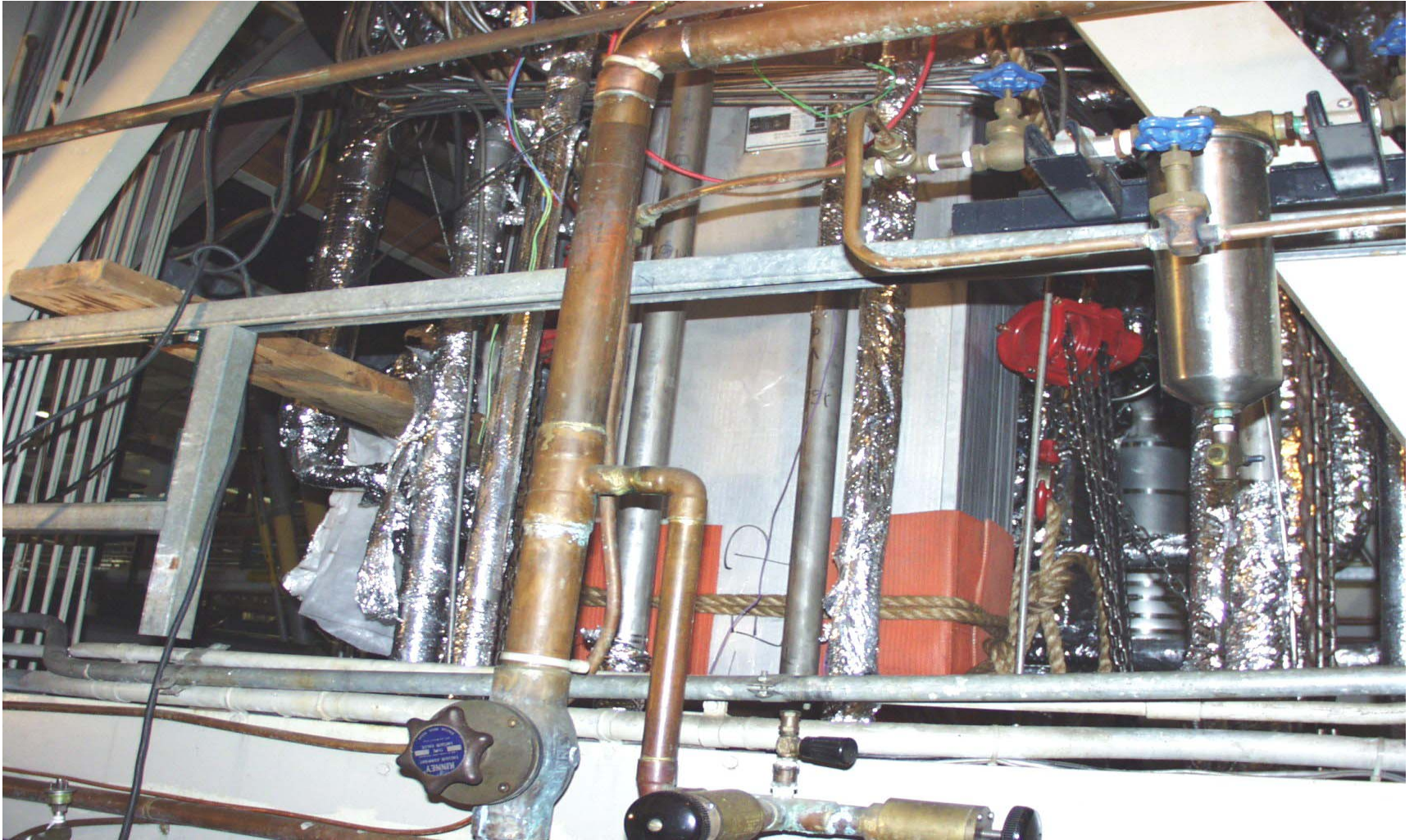
A.4) Heat exchanger high pressure outlet, low pressure inlet and LN2 inlet.



B.1) RIGGING



B.2) Heat Exchanger Rigging



C.1) Heat Exchanger removal.



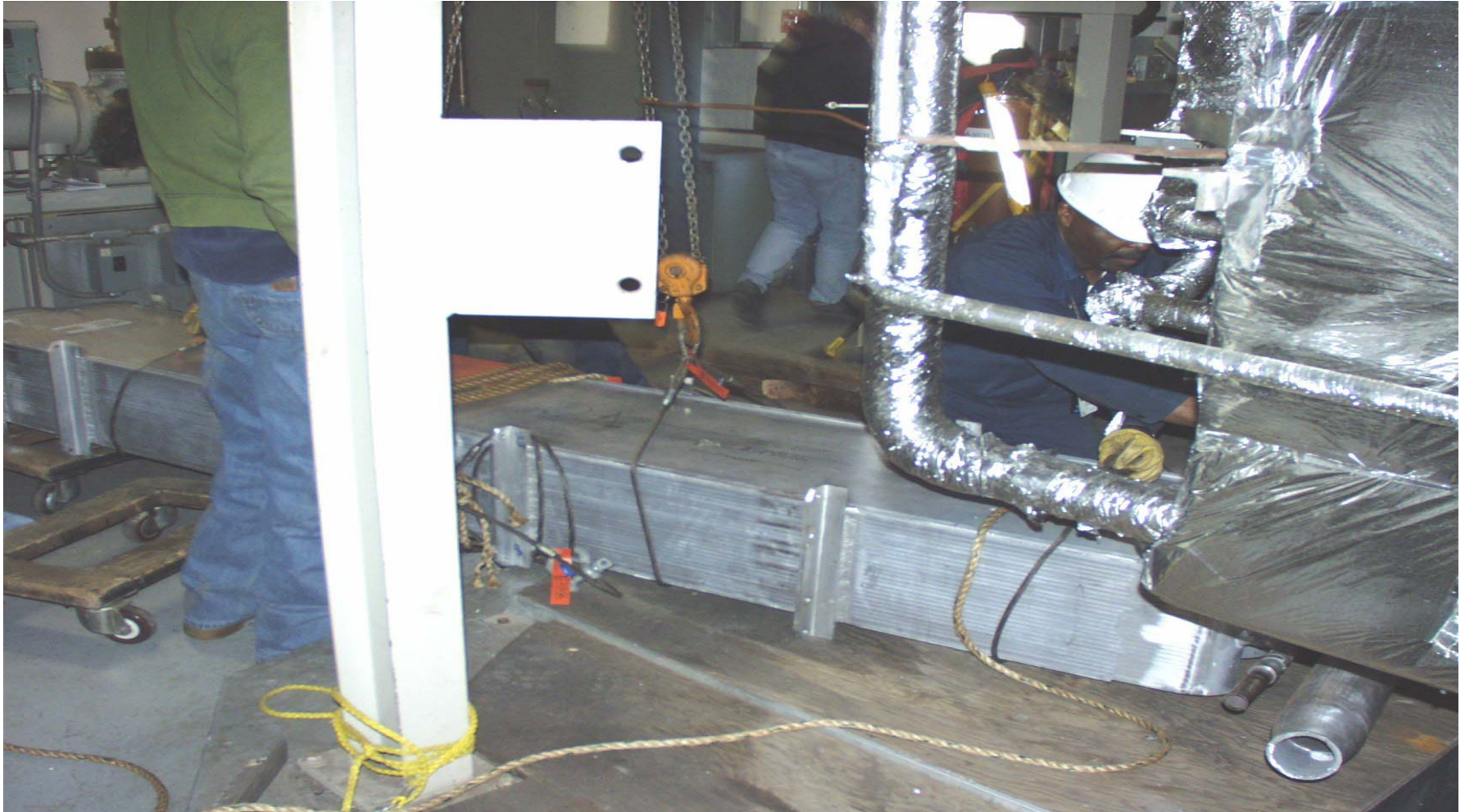
C.2) Heat Exchanger lowering



C.3) Heat Exchanger Removal From vacuum Can



C.4) Heat Exchanger Removal Completed



D.1) Pipe preparation (low pressure outlet.)



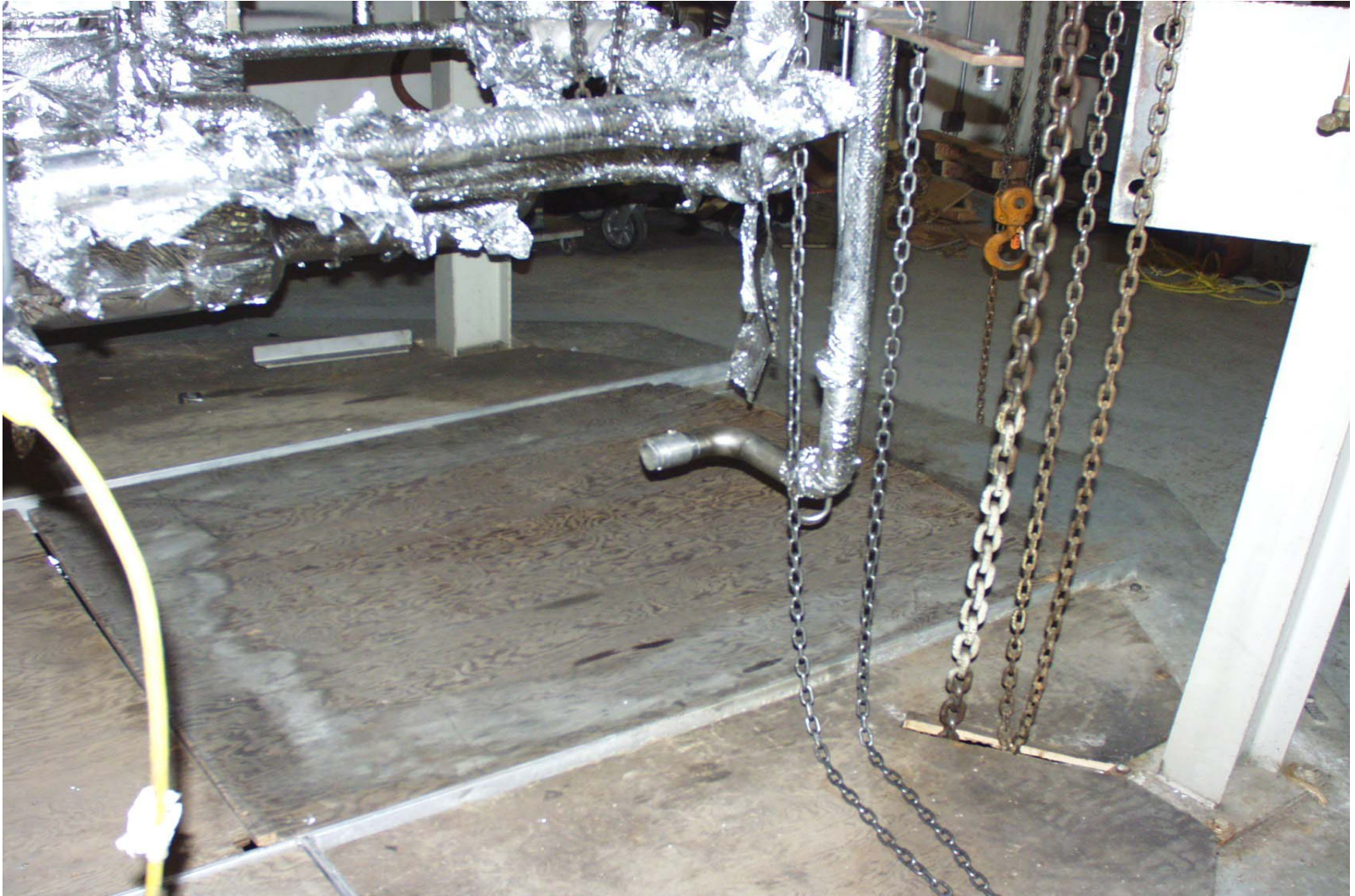
D.2) Pipe preparation LN2 outlet.



D.3) Pipe preparation high pressure inlet.



D.4) Pipe preparation high pressure outlet.



D.5) Pipe preparation low pressure inlet and LN2 inlet.



E.1) New heat exchanger installed (LN2 outlet.)



E.2) New heat exchanger high pressure outlet, low pressure inlet and LN2 inlet.



E.3) New heat exchanger high pressure inlet, low pressure outlet.



E.4) New heat exchanger insulated.



E.5) New heat exchanger insulated.

